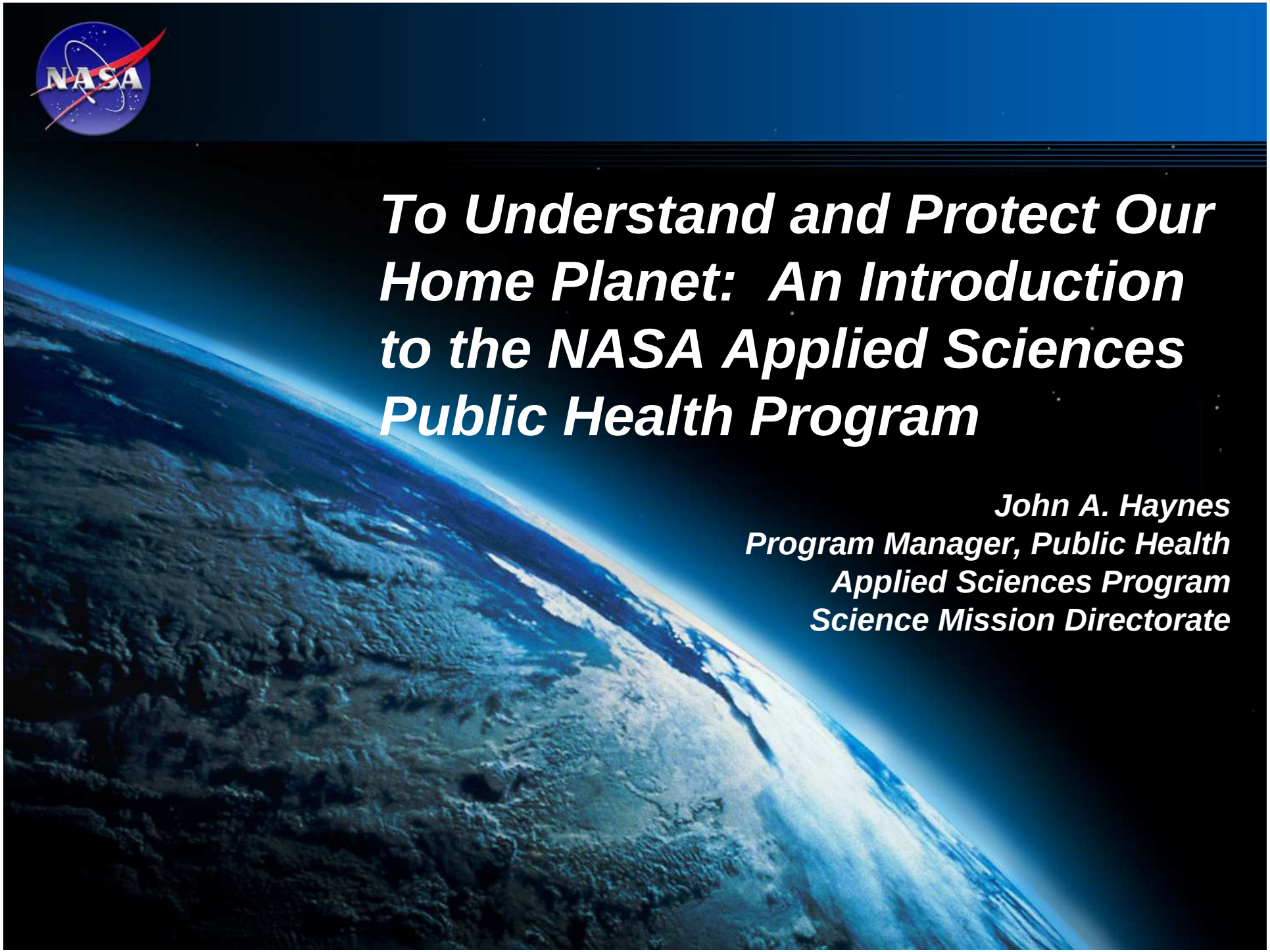
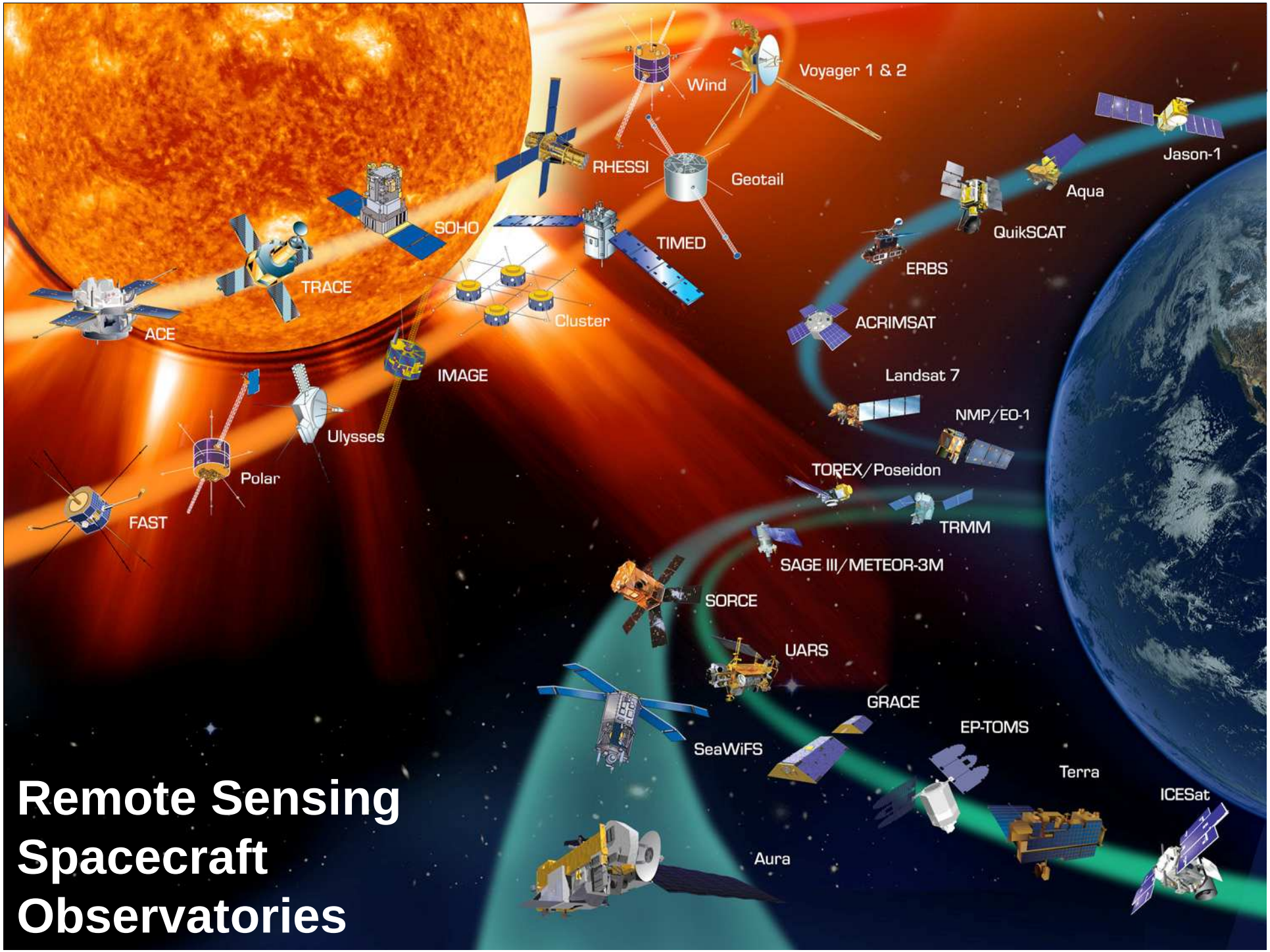
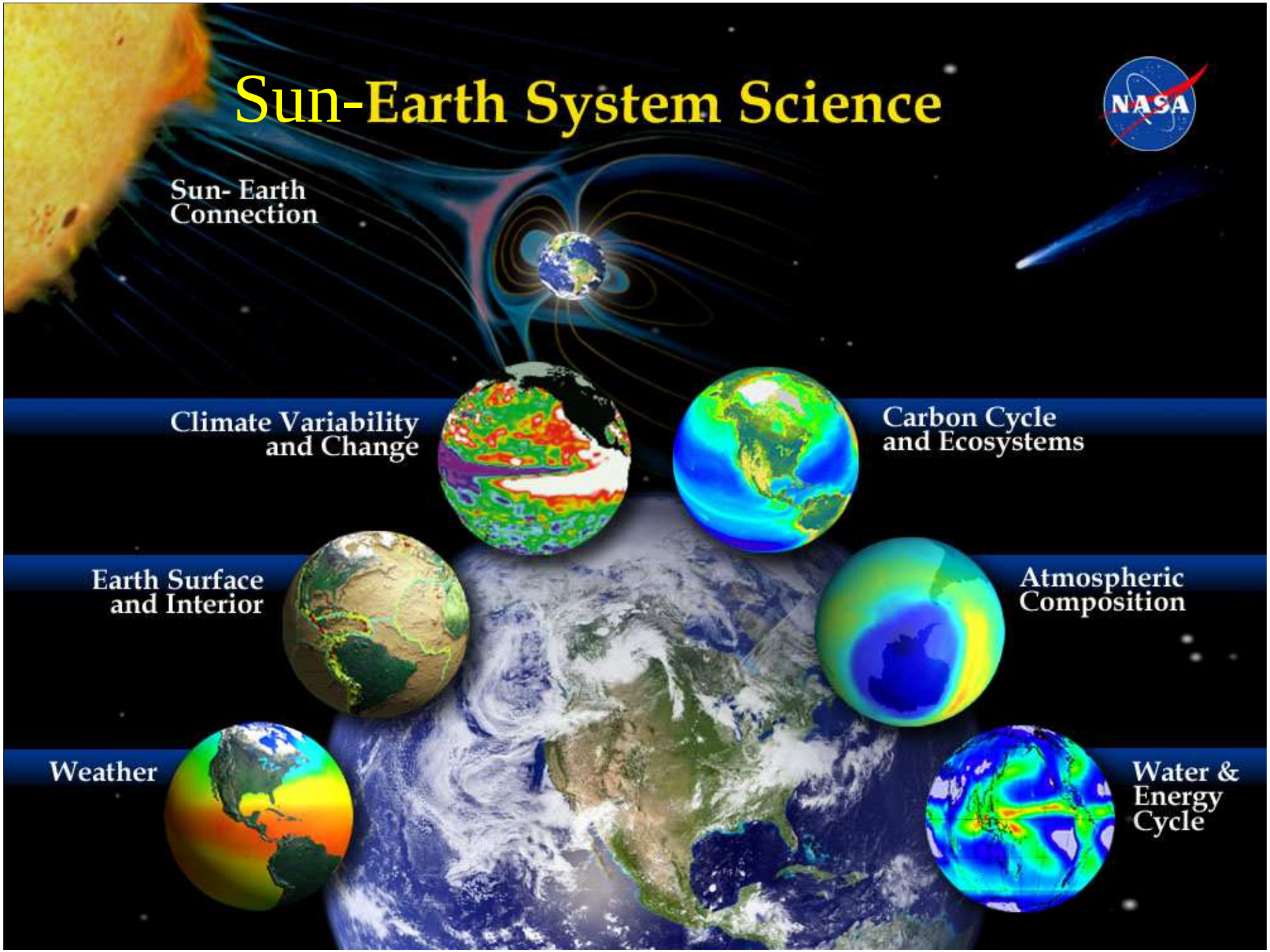


To Understand and Protect Our Home Planet: An Introduction to the NASA Applied Sciences Public Health Program

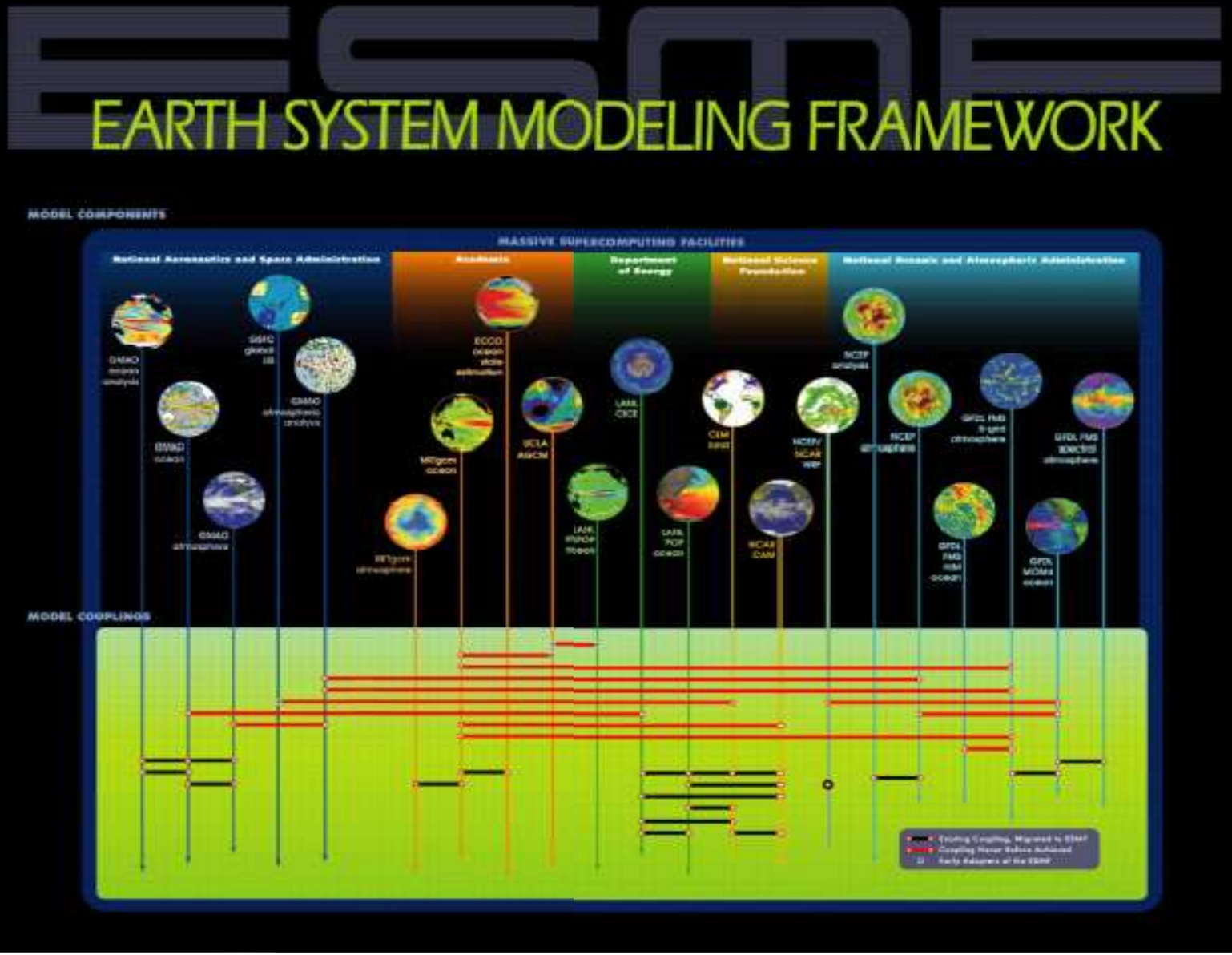
John A. Haynes
Program Manager, Public Health
Applied Sciences Program
Science Mission Directorate


The NASA Vision
To improve life here,
To extend life to there,
To find life beyond.
The NASA Mission
To understand and protect our home planet,
To explore the universe and search for life,
To inspire the next generation of explorers
... as only NASA can.

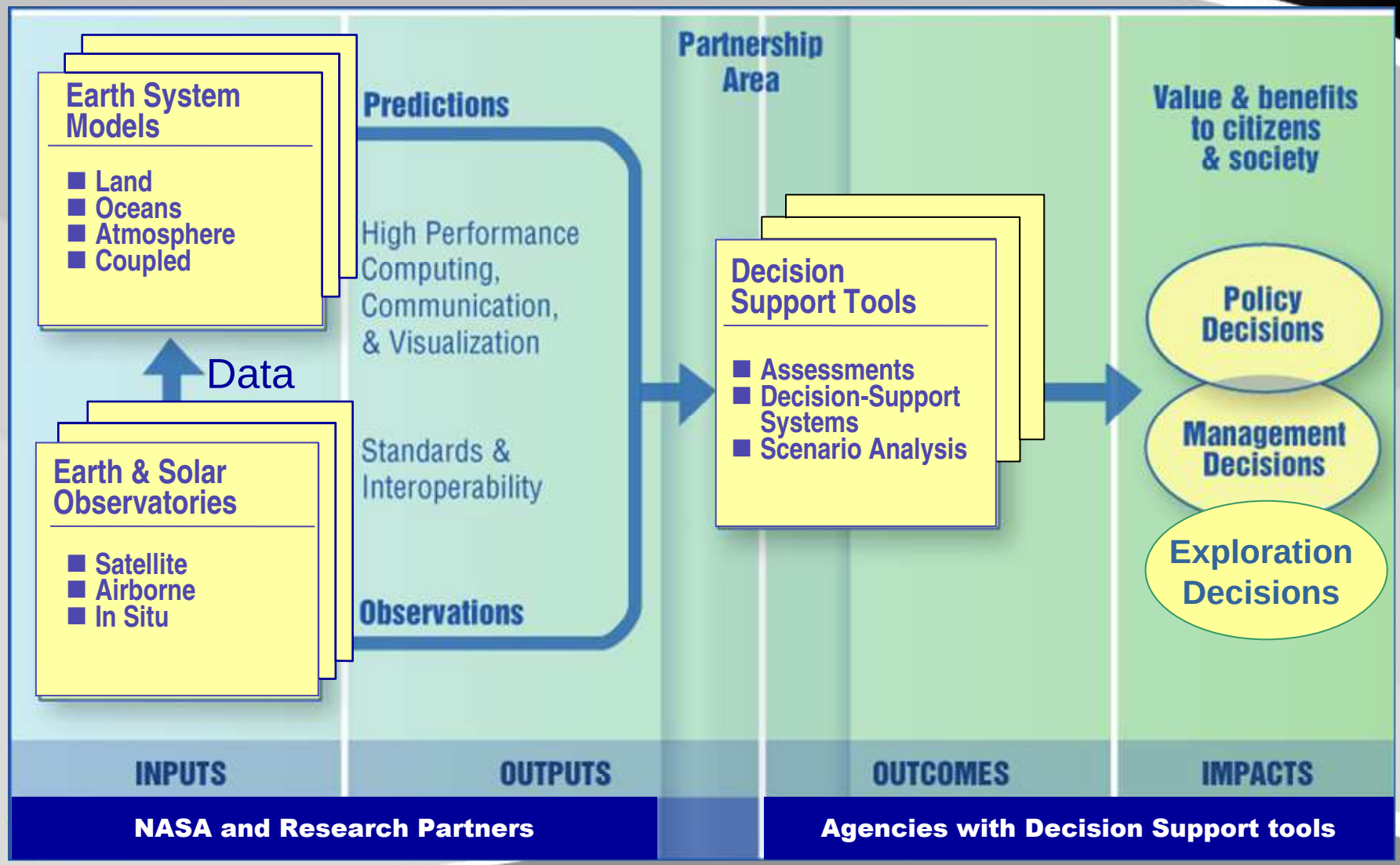

Wind
Voyager 1 & 2
RHESSI
Geotail
Jason-1
Aqua
SOHO
TIMED
QuikSCAT
ERBS
TRACE
Cluster
ACE
ACRIMSAT
IMAGE
Landsat 7
NMP/EO-1
Ulysses
TOREX/Poseidon
Polar
TRMM
FAST
SAGE III/METEOR-3M
SORCE
UARS
GRACE
SeaWiFS
EP-TOMS
Terra
ICESat
Aura
Remote Sensing
Spacecraft
Observatories


Sun-Earth System Science
NASA
Sun- Earth Connection
Climate Variability and Change
Carbon Cycle and Ecosystems
Earth Surface and Interior
Atmospheric Composition
Weather
Water & Energy Cycle

Earth System Models



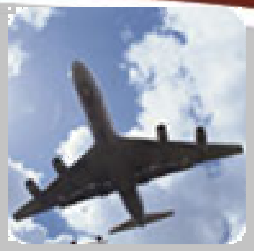
Integrated System Solutions



Applications of National Priority

Agricultural Efficiency

Air Quality



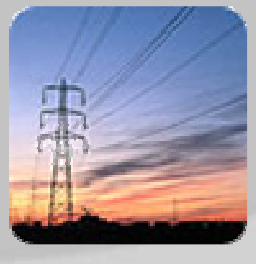
Aviation

Carbon Management

Coastal Management

Disaster Management

Ecological Forecasting



Energy Management

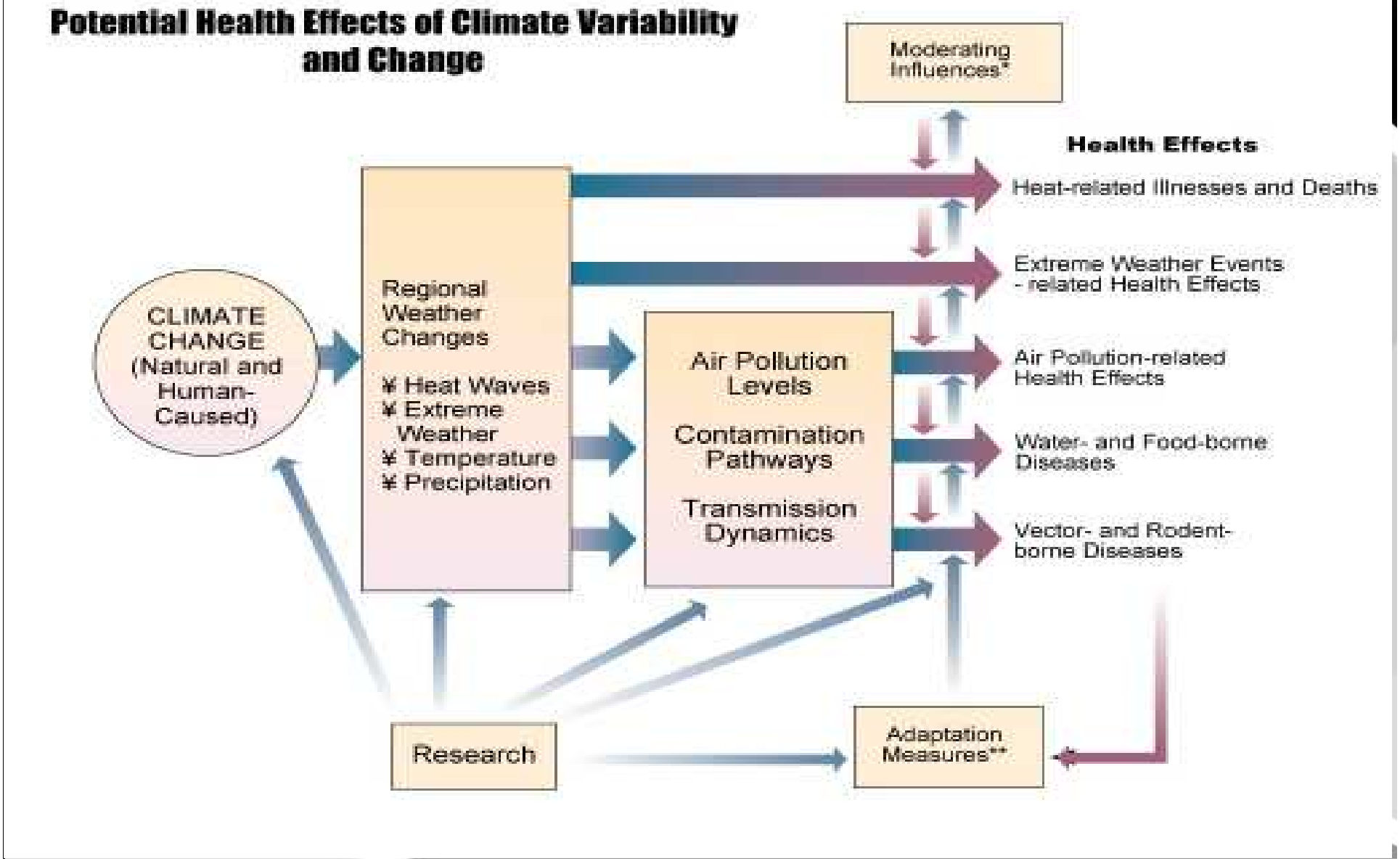
Homeland Security

Invasive Species

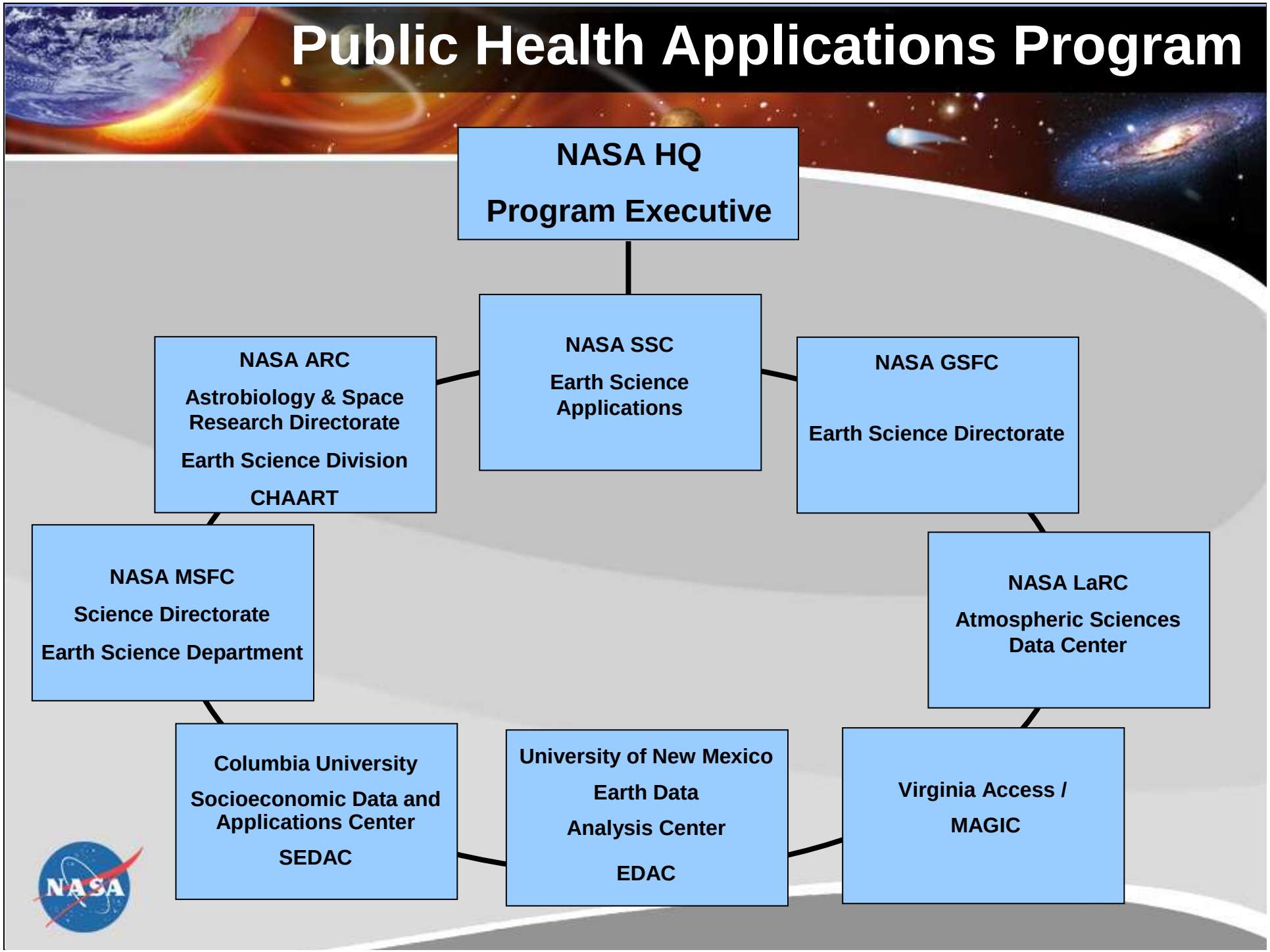
Public Health

Water Management

Why public health?



Public Health Applications Program



Public Health

Integrated System Solutions

EARTH SYSTEM MODELS

Terrestrial / Atmospheric: MAESTRO*
Climate Variability Models: GHCN
Land Surface Model: CLSM, LSE
Weather/ Seasonal Models: COLA
Science & Research: GSFC Plague Algorithm
Atmospheric / Ocean Models: GMAO

*Supported Non-NASA Model

Predictions

- Chemistry Climate Change
- Local & Global Long-Range Prediction of Pollutants
- CO_2 & CH_4 Atmospheric Concentration Projections

Data

MONITORING & MEASUREMENTS

- EO-1
- TRMM
- Terra, Aqua
  - ASTER
  - MISR
  - MODIS
- Landsat 4,5,7
- NPOESS*
- SRTM

- Land cover / land use
- Surface temperature
- Vegetation indices
- Aerosol properties
- Surface topography

*Future Mission

Biomass
- Soil Moisture
- Atmosphere Temperature
- Global Precipitation
- UV Irradiance
- Total Column Ozone
- Soil Moisture
- CO_2 & Methane
- Total Aerosol Amount

Observations

DECISION SUPPORT TOOLS

- EPHTN / HELIX
- ArboNet / Plague
- Malaria Surveillance/GSAT
- RSVP with TRIMS
- Department of Health and Human Service (DHHS) / Secretary's Command and Control Center (SCC)

VALUE & BENEFITS

Early warnings of harmful exposures, conditions favorable to vector proliferation

Improved prevention initiative targeting.

Reduction of environmental-related diseases

Improvement in bio-terrorism event information management

Surveillance Project: EPHTN

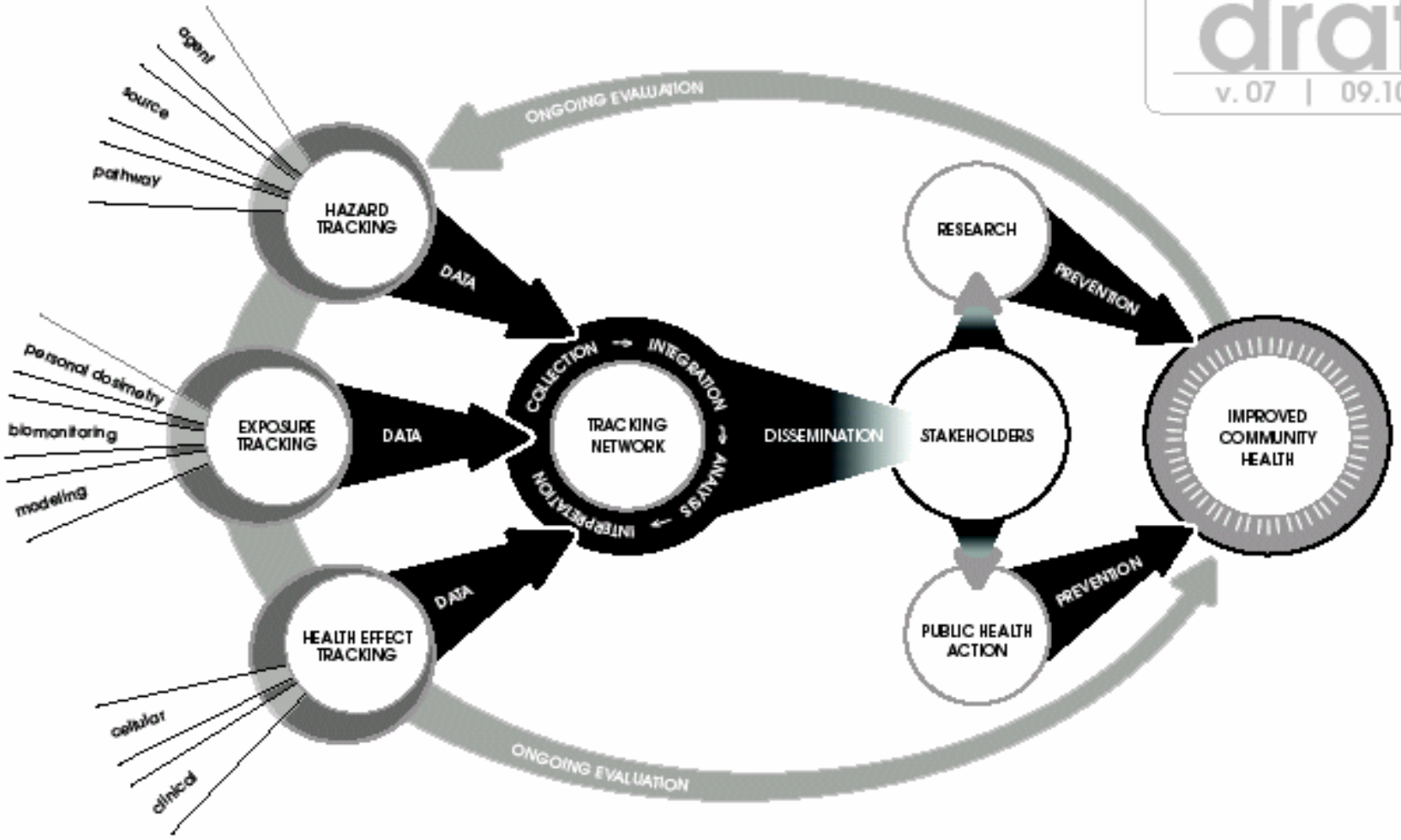
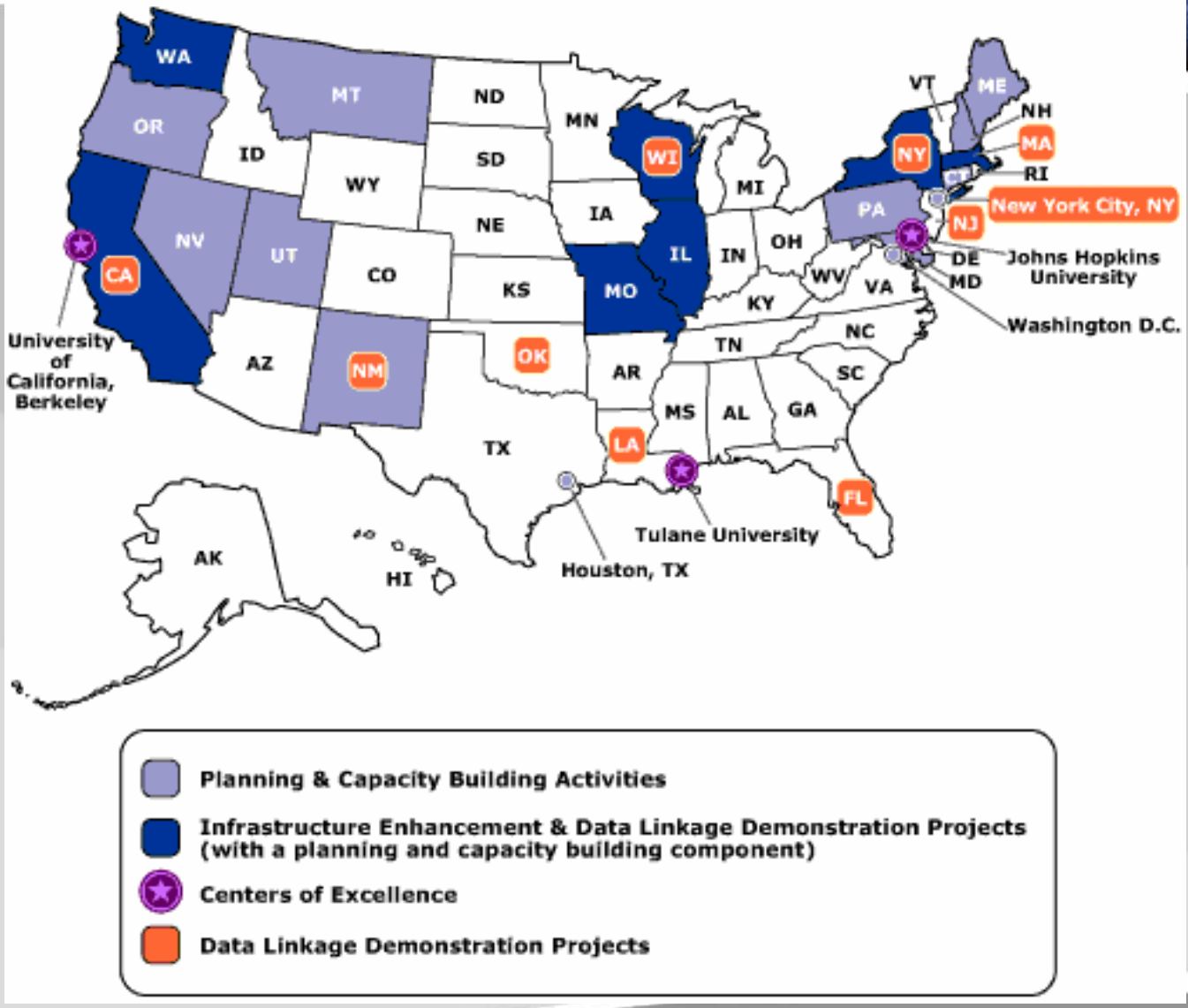


Figure 1: A conceptual model for Environmental Public Health Tracking

EPHTN Vision

- Data on a core set of:
  - chronic diseases and other health effects with possible environmental etiology
  - chemicals, physical agents, biomechanical stressors, biological toxins
- Enable states to track their own priorities, exchange data with states and the Fed
- Capacity to exchange data with EPA's National Environmental Information Exchange Network
- Part of CDC's Public Health Information Network
- Interoperable with the NEDSS

EPHTN Status



NASA – CDC / ATSDR MOU

Department of Health and Human Services
Public Health Service
Centers for Disease Control and Prevention (CDC)

MEMORANDUM OF UNDERSTANDING
Between
The National Aeronautics and Space Administration
Office of Earth Science, Applications Division
And
The National Center for Environmental Health/Agency for Toxic Substances and Disease Registry

I. Project Title:

Applications of Earth Science Research and Development for Environmental Public Health

II. Purpose and Scope

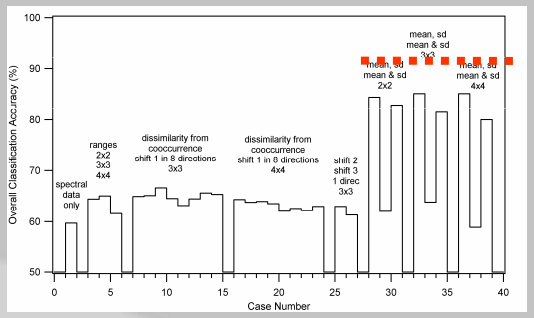
This Memorandum of Understanding (MOU) provides a framework for cooperation between the National Aeronautics and Space Administration (NASA) and the Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR) (hereinafter the Party or Parties) to explore the application of Earth system science, technology, and data to environmental public health.

A. This cooperation and coordination is not limited to the Parties to this MOU, and each Party, independently or jointly, may cooperate with other Federal agencies and their extensions; interested State, regional and local agencies, colleges and universities; private industries, nonprofit organizations; and foundations and public interest groups. All Parties view this MOU as important for exploring the utility of Earth system science, technology and data for characterizing the relationship between environmental hazards, human exposures and potential health effects. Of particular interest as a focus of collaborative activities is CDC's National Environmental Public Health Tracking Network.

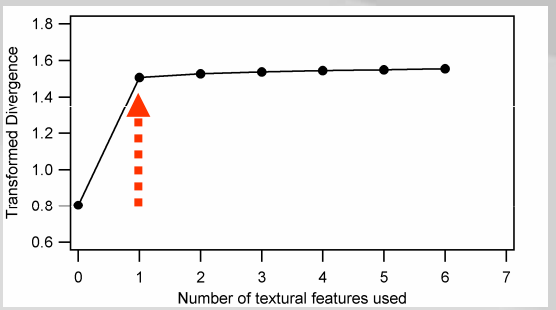
Surveillance Project: Malaria/GSAT

Habitat identification

Textural/contextual classifications significantly increase landcover mapping accuracy using high resolution data such as Ikonos.



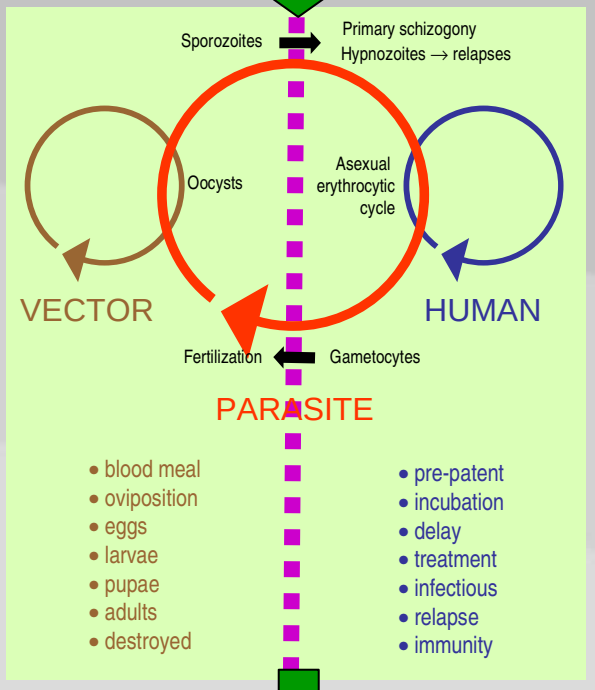
Discrete Wavelet Transform is used to differentiate confusion vegetation types.



Evaluated Thail military **airborne data** and established **neural network rectification** capability.

Identifying key factors that sustain or intensify transmission

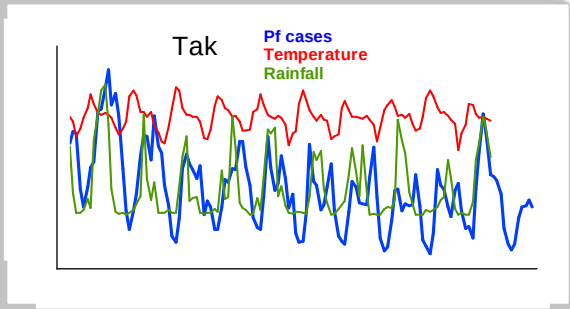
- Satellite & meteor. data
- Microepidemiology data
- Local environment
- Population database
- Landcover
- Dwelling
- Host behaviors
- Vector ecology
- Vector control
- Medical care



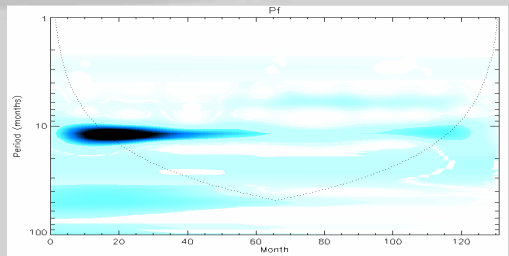
Spatio-temporal distribution of disease cases

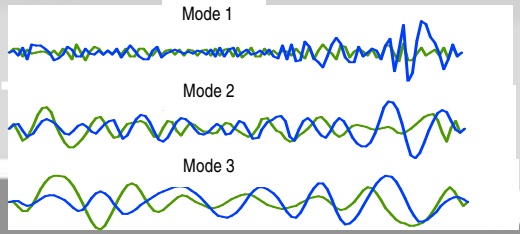
Risk prediction

Nonparametric model computes the likelihood of disease outbreak using meteorological and epidemiological time series as input.



Wavelet Transform and **Hilbert-Huang Transform Empirical Mode Decomposition** identify the driving variables that lead to disease outbreaks and provide more accurate predictions.

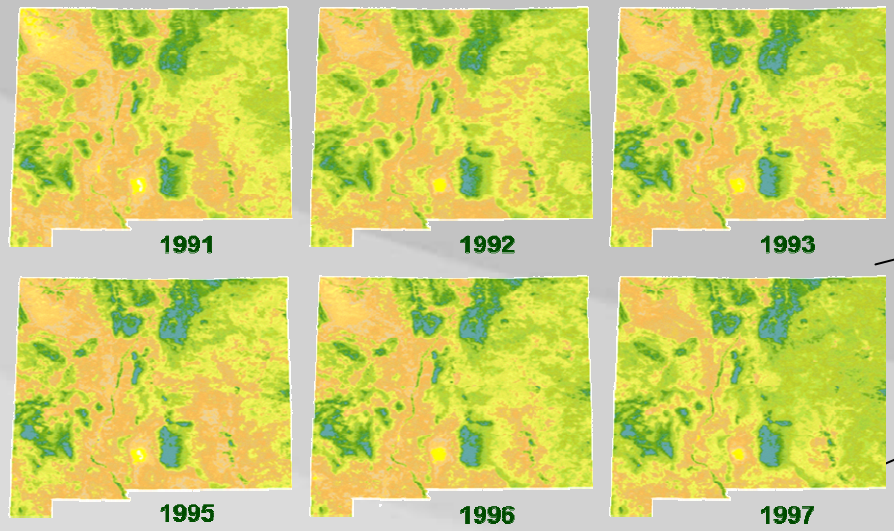


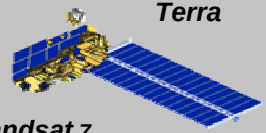


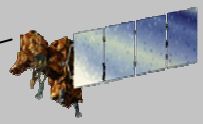
Richard.Kiang@nasa.gov

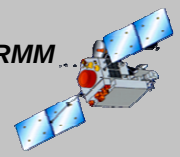
Surveillance Project: ArboNET/Plague

Vector habitats, seasonal lifecycle variations, migration pressure from rainfall, soil moisture, vegetative cover, surface temperature, elevation, and slope.

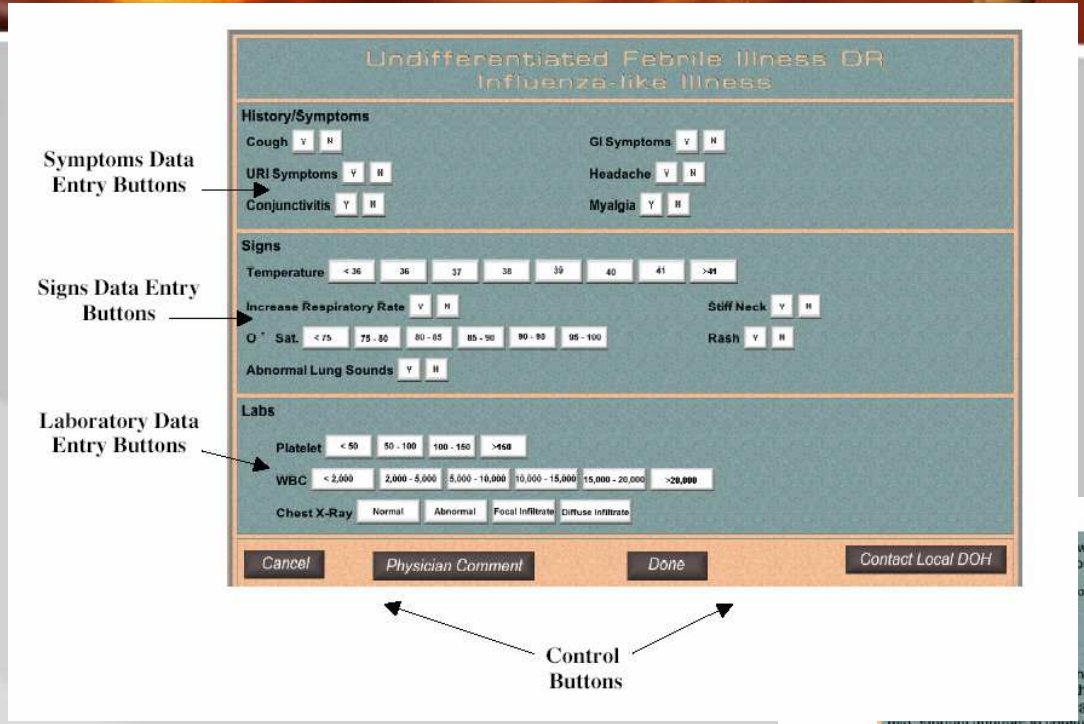


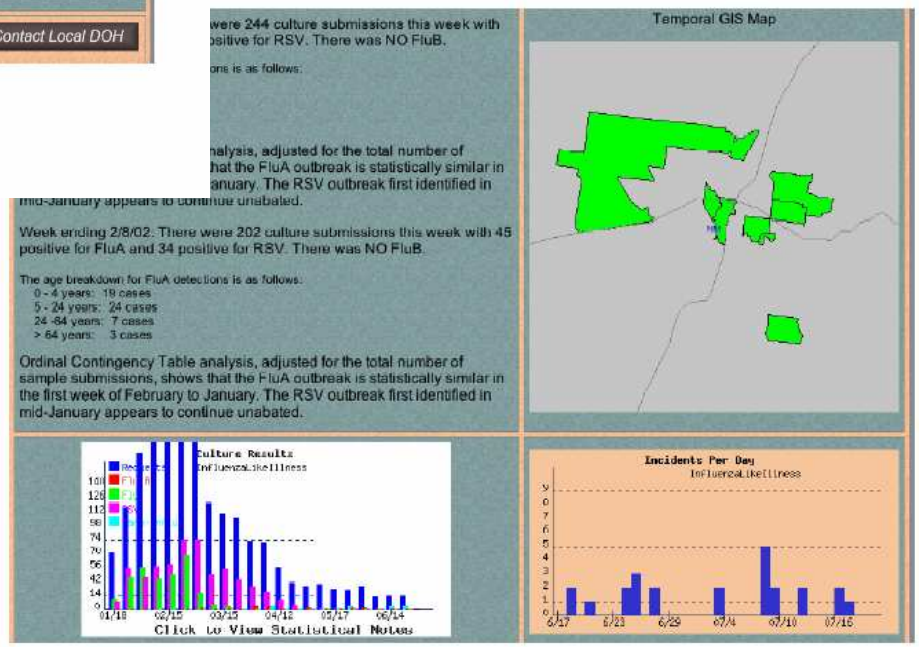






Surveillance Project: RSVP

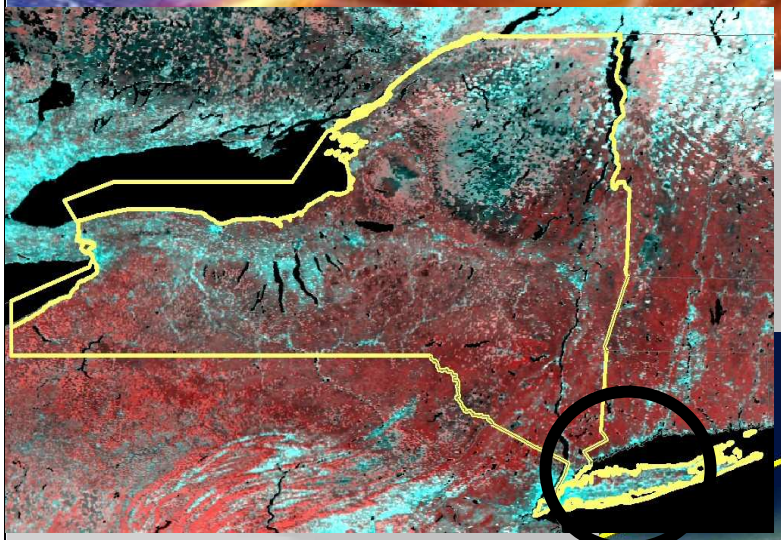




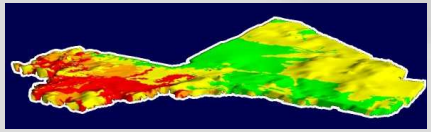
DHHS Secretary's Command and Control Center

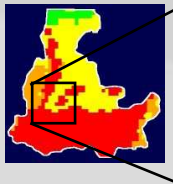
- The DHHS Secretary's Command Center (SCC) will serve as the national incident command center for all health and medical preparedness, response, and recovery activities.
- In 2005, our program is evaluating the SCC for integration of NASA Earth Science satellite observations and model predictions.
- An MOU with DHHS is expected by the end of the year.

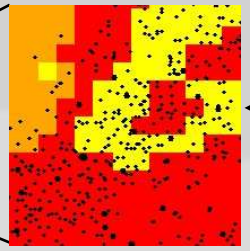
Privacy and medical confidentiality

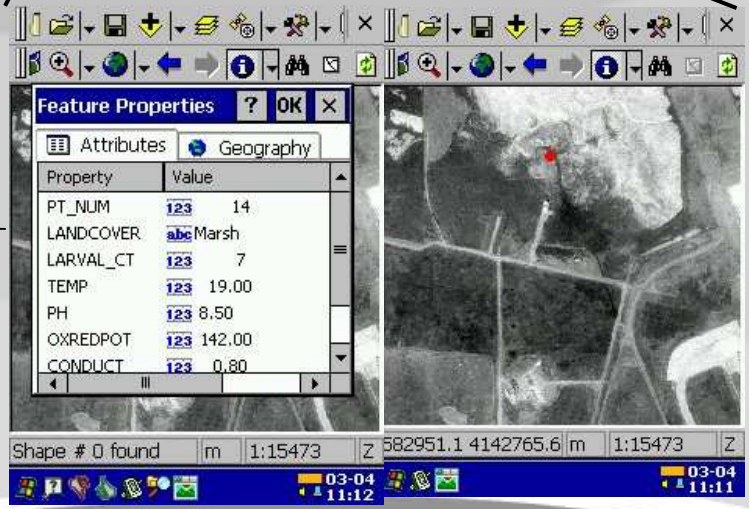


Workforce development



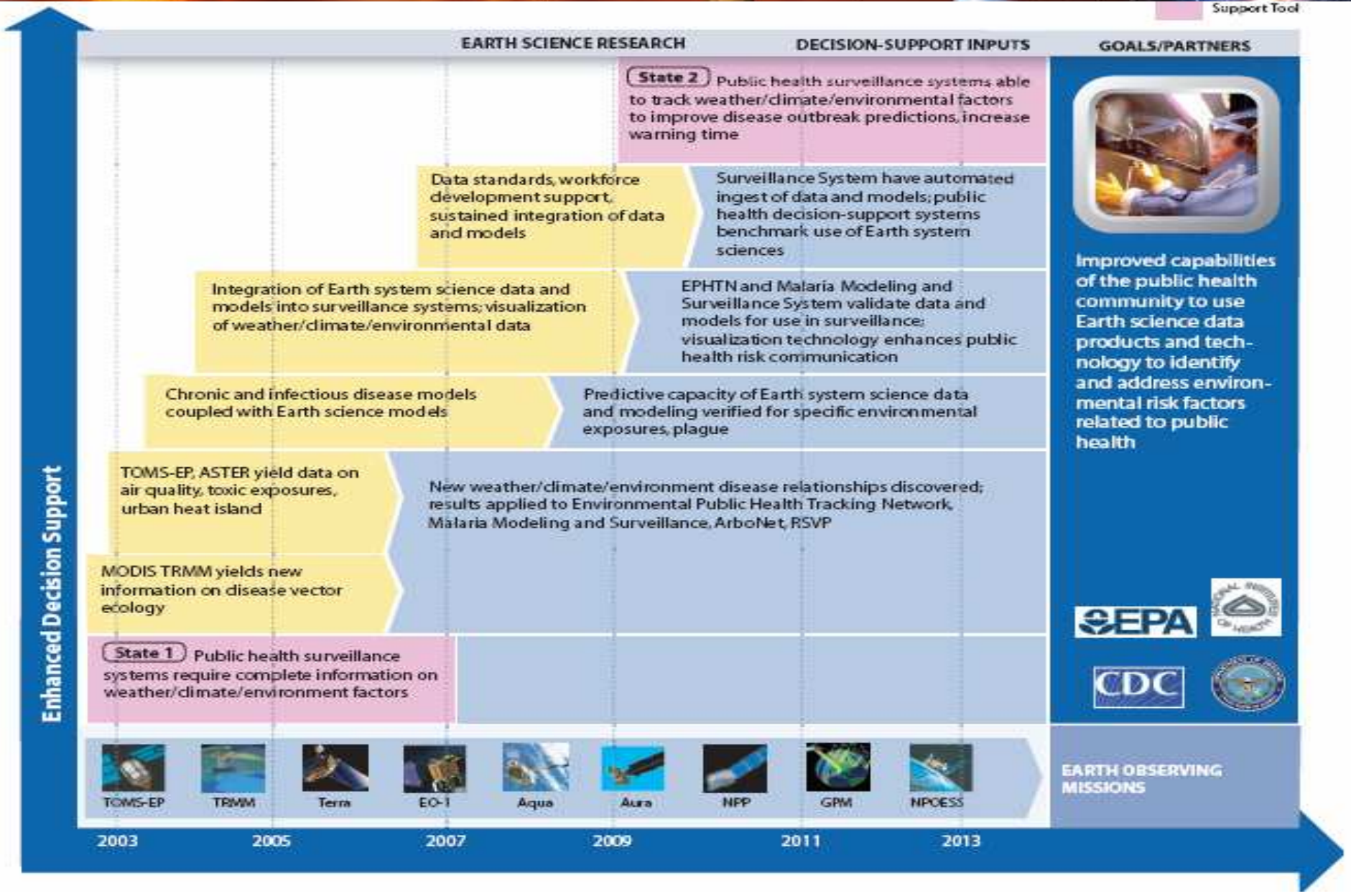






NASA

Public Health Roadmap



NASA's Public Health Partners

.gov/ph

.gov/rs

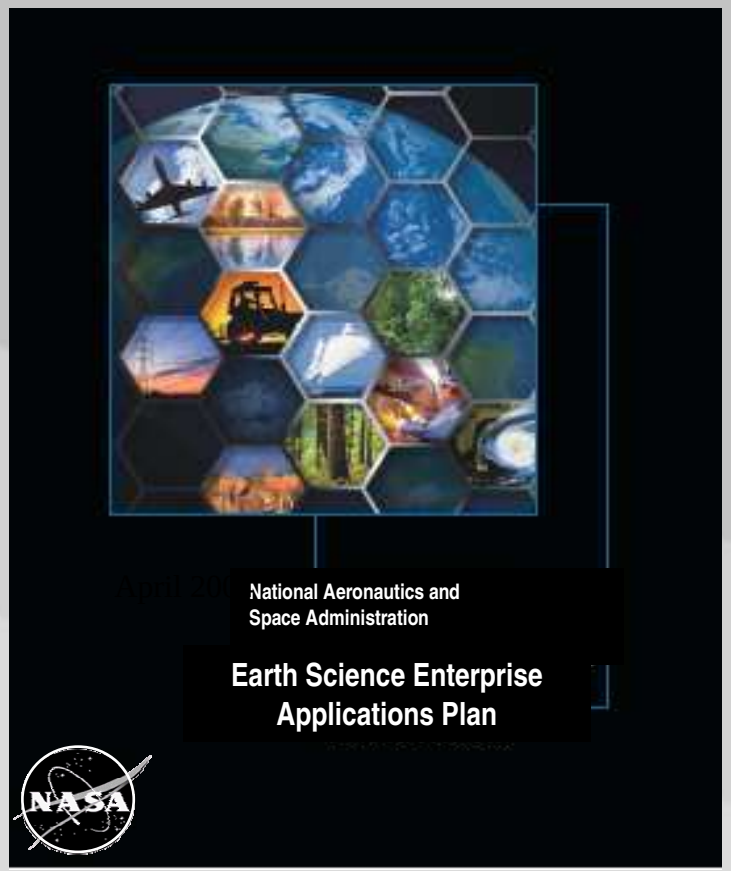
.org

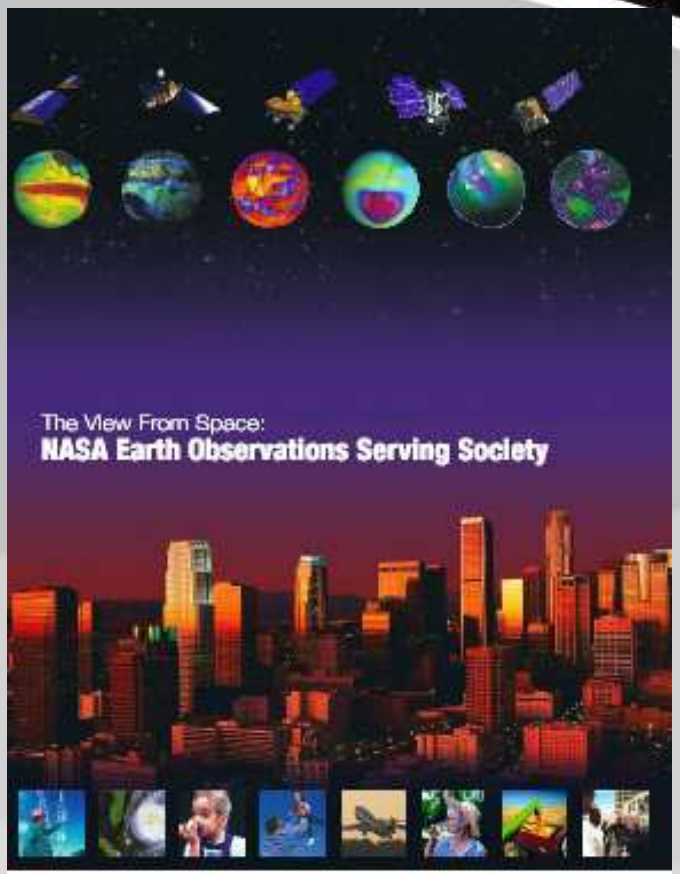
.edu

.int

.mil

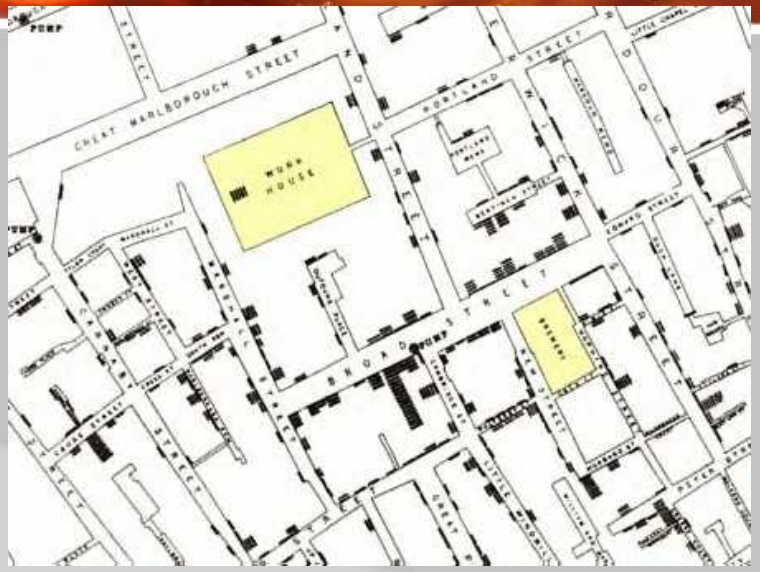
Applied Sciences Program

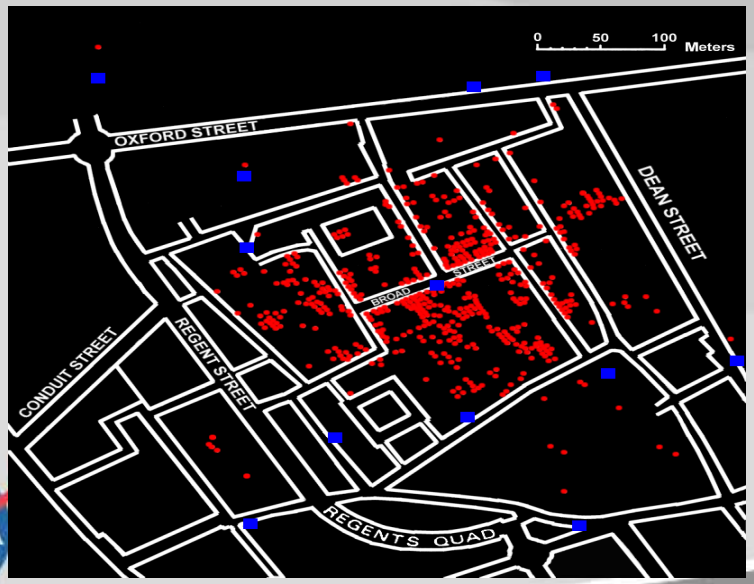




http://science.hq.nasa.gov/earth-sun/applications/index.html

Epidemiology in the 21st Century





NASA